

## Permutations and Combinations

### Permutations:

- Arranging...

$n$  objects taking  $r$  @ a time

- Formula:

$$\frac{n!}{(n-r)!}$$

On calculator:

$nPr$  ← # choosing  $n$  → **MATH** → PIZB →  $nPr$   
total poss.

- ORDER DOES MATTER

- More... possibilities

- **Example:**

For a Fundraiser, 50 raffle tickets were sold. 1st, 2nd, and 3rd place prizes will be awarded. How many different ways are there to hand out these prizes?

Ex: Permut.

Prizes

Positions

Pres/VP

$$50 nPr 3 = 117,600$$

## Combinations:

- The number... of groups of  $n$  objects,  $r$  @ a time

- Formula:

$$\frac{n!}{r!(n-r)!}$$

On calculator:

$$nCr$$

$$\boxed{\text{MATH}} \rightarrow \text{PRB} \rightarrow nCr$$

- ORDER doesn't MATTER

- Less... possibilities

- Example:

We want to randomly select a sample of 8 students from a class of 21. How many different samples are possible?

$$21nCr8 = 203,490$$

### Counting Rules:

- Looking for... *all possible ways to combine diff. groups*

- For groups of sizes m, n, and t (using all possibilities in each group)

- Formula:

$$m \cdot n \cdot t$$

- Example:

A person wants to make a sandwich from a buffet. On the buffet, there are 3 types of bread, 4 types of cheese, 3 types of lunchmeat, and 3 different condiments. If the person wants a sandwich that consists of bread, cheese, lunchmeat, and a condiment, how many different possibilities are there for his sandwich?

$$3 \cdot 4 \cdot 3 \cdot 3 = \underline{108}$$

$\uparrow$   
 $(3nP_1 = 3)$   
 $3nC_1 = 3$

$\uparrow$   
 $4nC_1 = 4$

### Putting it all together....

- Sometimes we can use both permutations, combinations, and counting rules together:

#### **Example:**

We want to form a committee that consists of a 2 member executive board (president and vice-president) and an executive council that is 6 members, which will advise the president and VP. There are 30 people in the organization to choose from. How many different possibilities are there for this selection?

$$\begin{array}{cc} \text{exec board} & \text{exec. council} \\ (30 \text{ nPr } 2) \cdot (28 \text{ nCr } 6) & \\ \hline 327,763,800 & \end{array}$$